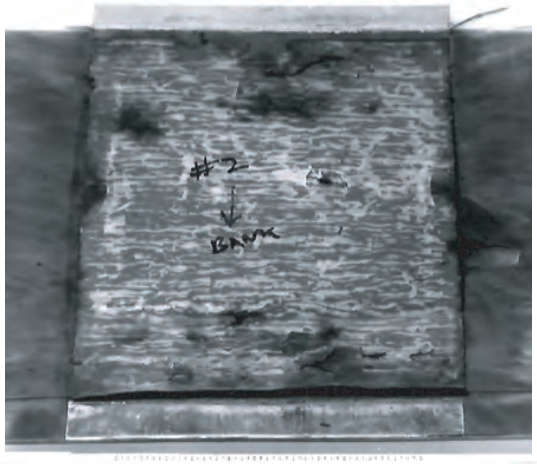
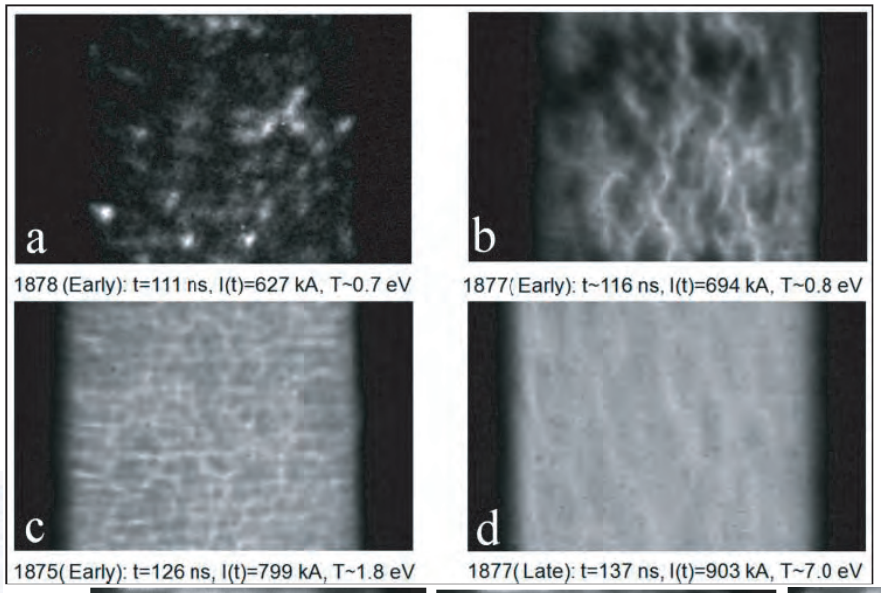
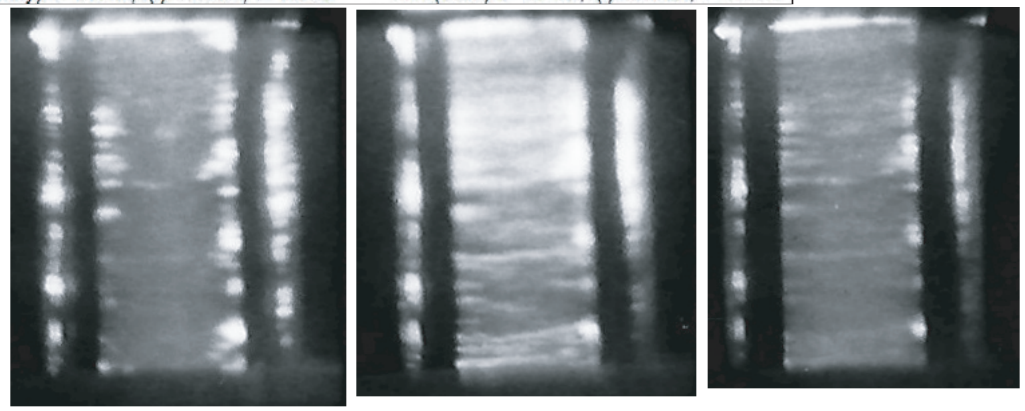
The metal transformation from liquid into vapor and plasma is a complex, three-dimensional process; can this process be adequately characterized by std Maxwell-construct EOS?



Al foil fuse , mylar tamped, post-shot
I. Lindemuth et al., Proceedings of
MG-IV Conf., 1986



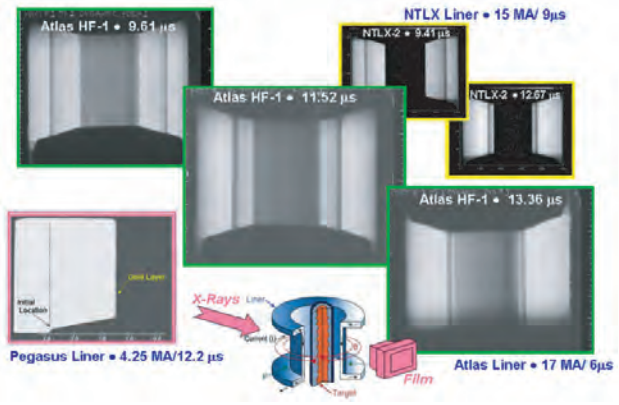
1-mm-diameter
Al rod, T. J. Awe
et al., POP 18
056304 (2011)

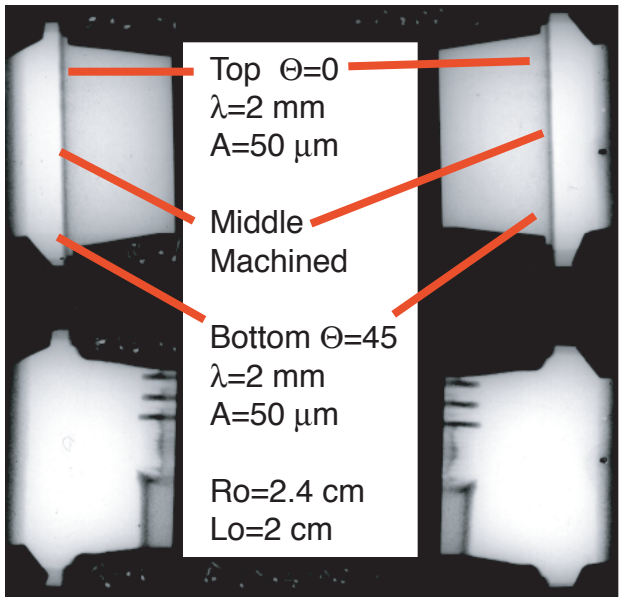


25 cm x 75 cm copper foil test load for MCG, I. Lndemuth et al.,
J. Appl. Phys. 67, 1990 (376.3 μs, left; 377.6 μs, ctr; 378.2 μs, right)

Solid and liquid magnetically driven liner technology is relatively mature; the magnetically driven Rayleigh-Taylor instability is a concern; plasma liners are less understood, more unstable.

- **LANL has demonstrated high-precision implosions on a variety of facilities; two-dimensional MHD computations agree well with observations and offer insight into design considerations for stability (Reinovsky et al., IEEE Trans. Plas. Sci. 36, p. 112, 2008).**



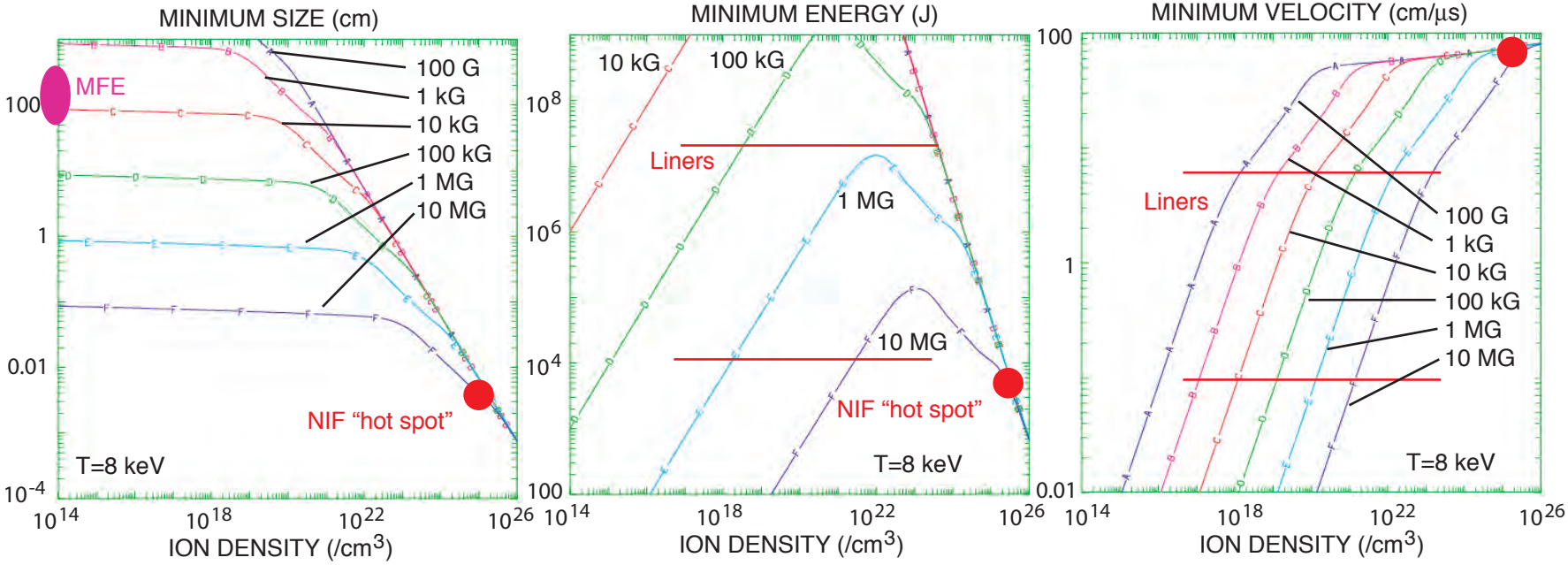


LANL/VNIIEF

- **A joint AFRL/LANL liner experiment showed good stability at a radial convergence of ~ 17 (Degnan et al., IEEE TPS 36, p. 80, 2008).**
- **A joint LANL/VNIIEF experiment (left) showed that imposed screw perturbations lead to a stable implosion (Anderson et al., 2001 IEEE Pulsed Power Conf. Digest of Papers, p. 354); the generality of this technique has yet to be explored, may apply to MagLIF.**

The Lindemuth-Siemon model of fusion parameter space should be extended to MagLIF targets

- **The simple model was surprisingly accurate where heat flow is perpendicular to the magnetic field ("The fundamental parameter space of controlled thermonuclear fusion," Am. J. Phys. 77, p. 407, 2009).**

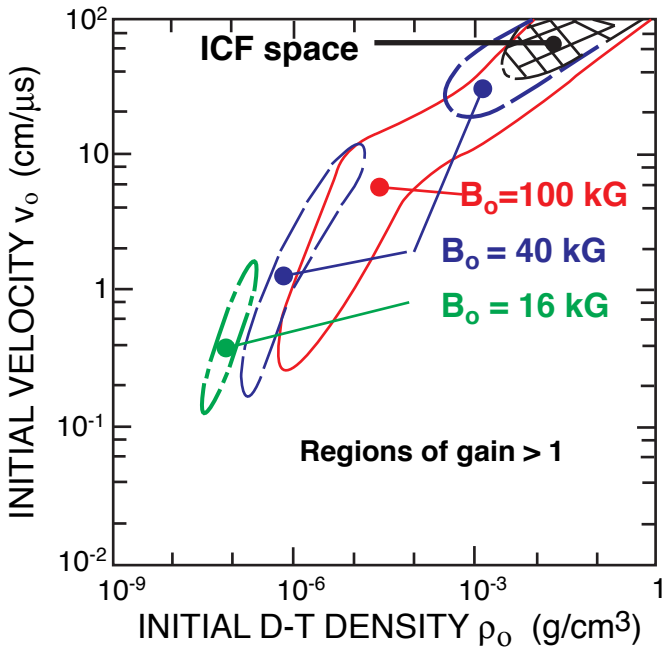


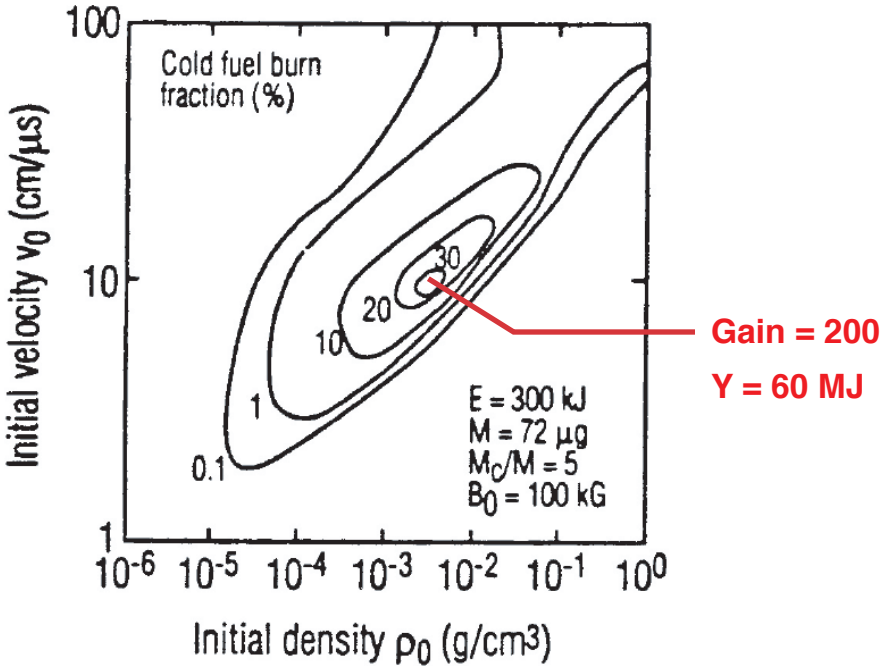
- **Thermal conduction in a cylinder (r,L) with Bz is more complex:**

$$Q_{TC} = \frac{2T}{\alpha_r r^2}\left(K_\perp + K_{//}\frac{\alpha_r}{\alpha_L}\frac{r^2}{L^2}\right);\ \alpha_r,\ \alpha_L \text{ radial, axial gradient scale factors.}$$

The Lindemuth-Kirkpatrick target implosion model should be extended to MagLIF targets.

- **The simple "batch burn" model predicted that magnetized targets would work over a wide range of velocity, e.g., FRCHX at low velocity, MagLIF at high velocity (Nuc. Fus. 23, p. 263, 1983).**





- **MagLIF is operating in the high density, high velocity parameter space where a "cold fuel" extension of the L-K model predicted that high gain could be obtained (Fusion Technology 20, p. 833, 1991).**